PROJECT PLAN

Level I Water Quality Inventory

Sagamore Hill NHS

Charles N. Farris, CACO Coastal Laboratory, (508) 487-3262 ex. 105.

Introduction

In association with the *Baseline Water Quality Data Inventory and Analysis Program*, the NPS-Water Resources Division has assembled existing water quality data sets collected in most park units throughout the nation (USDOI, 1998). One small park on Long Island (Sagamore Hill NHS) was found to have a depauperate water quality database, thereby requiring a Level I water quality inventory. As defined by the NPS Inventory and Monitoring Program, a Level I water quality inventory includes sampling basic water quality parameters for key water bodies within park boundaries. Key water bodies are either those essential to the cultural, historical or natural resources management themes of the park or those that provide habitat for rare plants or animals.

The purpose of this study is to collect water quality data at this park to meet the Level I needs. Moreover, this study will identify key water quality management issues at this park, if warranted, and recommend appropriate long-term water quality monitoring strategies.

Study Sites

This park, Sagamore Hill NHS (SAHI) is found in Oyster Bay, Long Island, New York. The water resources to be included in the Level I water quality inventory are described below.

Sagamore Hill is the remnant of the estate and summer White House of the 26th president, Theodore Roosevelt. The NHS has mature hardwood forest stands, ornamental grounds and lawns as well as significant water resources. This NHS has been selected for a comprehensive NPS reptile and amphibian survey because of the number of wetland habitats present. These are characterized by a number of small freshwater ponds and vernal wetlands in addition to a nine-acre salt marsh on one end of the NHS. Land use adjacent to Sagamore Hill is low density residential, with a minimum lot size of five acres. Five sites will be sampled: 1) Woodpile Pond, 2) the Northeast vernal wetland, 3) the Northeast vernal wetland, 4) the Lower Lake (the Heron Pond) and 5) the Eel Creek salt marsh (Fig. 1).

Woodpile Pond – This pond is largest permanent pond in the Park Unit. It is approximately 1.2 m deep and 12 m wide. It supports a number of reptiles and amphibians. The Park parking lot is near the pond. This lot and a construction site adjacent to the Park are altering natural drainage patterns and may lead to excessive run-off, silting and organic loading.

Intermittent wetlands - Numerous intermittent wetlands are distributed throughout the

Park. Two of these wetlands have been identified as an important site for monitoring, and may be representative of the water quality status of wetlands within the park.

Northwest intermittent wetland – This freshwater bog and shrub complex is indicative of the wetlands that are associated with the "multitude of gullies and natural drainages" in the Park (Scott Gurney, SAHI staff, personal communication). These wooded areas will be a focus of the herpetological survey as well. This site is thought to be potential four toed salamander habitat and will provide baseline environmental data.

Southeast intermittent wetland – This freshwater bog and shrub complex is similar too the northwest vernal wetland. However, the wetland is close to the border of the park on the other side of which the private residence has conducted an extensive landscape effort. This project probably changed the drainage patterns of this portion of the sub-watershed. This wetland will be sampled to document possible impacts of landscaping activities in this residential location on Park water resources.

Heron Pond - A Nature Conservancy report (Kiviat, 1997) described the Pond as a 30 x 12 m woodland pool just south of the main east-west Park trail, 30 cm deep. Shrub species of dogwood, *Viburnum* sp., birch and willow are scattered around the shoreline. This habitat is thought by the Nature Conservancy to be critical habitat for a variety of state listed amphibians such as the spotted and four-toed salamanders, the wood frog and the eastern spadefoot toad.

Eel Creek salt marsh – The salt marsh empties into Cold Spring Harbor, an embayment of Long Island Sound and is separated by a broad, high beach of gravelly sand from the Harbor on the eastern side. There is a well-developed tidal creek that runs the length of the marsh. The marsh is typified by significant stands of *Spartina alterniflora* and *Distichlis spicata* with other emergent estuarine plant species. Besides the seminal importance of salt marsh stands for critical habitat for plant and fish species, the high marsh-beach berm area may serve as habitat for seaside sparrows, American oystercatchers and piping plovers.

Principal Investigators

Charles Farris (NESO-Boston) will serve as principal investigator on this project. Krista Lee, chemist at CACO, will perform laboratory analyses. A full-time GS-5/7 technician will be hired to facilitate field collections, lab analyses, and data management. For each data collection, it is intended that Dr. Farris and the technician will visit the park and collect the appropriate samples in cooperation with park personnel. Equipment calibration, lab analyses and data management will be performed by Krista Lee and the technician. Charles Farris will be responsible for preparation of the final data reports and recommendation of future monitoring actions. The data from this study can also be used to evaluate potential amphibian habitat identified by the NPS study by Robert Cook and the New York Zoological Society.

Sampling plan

The objective of this water quality monitoring program is not to assemble a comprehensive database, but rather to obtain a baseline of environmental variables. Should degrading trends in these fundamental variables be noted, then management should implement a more comprehensive program to clearly assess the problem.

At least once a season, from October 1999 to October 2000, monitoring sites will be chosen at each park. Samples will be collected in the fall (October - November 1999; September 2000), winter (January - February 2000), spring (March - April 2000) and summer (July - August 2000). Parameters will be sampled as outlined in Table 1.

Table 1 Sampling parameters for each station

Station	Sampling Parameters
Woodpile Pond	Alkalinity, chlorophyll a, conductivity, total and dissolved nutrients, major cations and anions, dissolved oxygen, pH, turbidity, temperature, TSS, water level, aluminum
Northwest intermittent wetland	Alkalinity, conductivity, total and dissolved nutrients, major cations and anions, dissolved oxygen, pH, temperature, water level, aluminum
Southeast intermittent wetland	Alkalinity, conductivity, total and dissolved nutrients, major cations and anions, dissolved oxygen, pH, temperature, water level, aluminum
Heron Pond	Alkalinity, conductivity, total and dissolved nutrients, major cations and anions, dissolved oxygen, pH, temperature, water level, aluminum
Eel Creek salt marsh (tidal sampling)	Alkalinity, conductivity, total and dissolved nutrients, major cations and anions, dissolved oxygen, pH, temperature, *Spartina* biomass estimation

Protocols

Site Access

Pond stations will be sampled from a canoe at the middle of the basin or from the water's edge in the dry season. Wetland samples will be sampled from the water's edge. The Elm Creek will be sampled from a station established in the middle of the shallow tidal creek. All sampling locations will be identified by GPS coordinates.

Sample collection techniques

For the ponds, surface to bottom profiles will be conducted with a Hydrolab at 0.5 m intervals for dissolved oxygen, pH, temperature, conductivity and turbidity. Discrete water samples will be collected just below the surface unless the Hydrolab profiles indicate a stratified water column. Then surface, mid-depth and bottom samples will be collected. All samples will be collected with a Kemmerer bottle.

For alkalinity, 60-ml sample bottles will be filled to overflowing, capped without an airspace and placed on ice for transport to the CACO laboratory. A one-liter bottle will be collected and placed on ice for transport to the CACO laboratory for the chlorophyll a and aluminum samples. Twenty ml of water will be placed in pre-cleaned test tubes and fixed with potassium persulfate and transported to the CACO laboratory for total nitrogen and phosphorus samples. Sixty-ml sample bottles for dissolved nutrients will be filled with water filtered through 0.4 micrometer Millipore filters, preserved with 2 N hydrochloric acid and iced for transport to CACO. Separate sixty-ml bottles will be collected for cation and chloride and sulphate ion analysis. All samples will be kept in the dark at 4°C until analysis preparation is completed.

Analytical techniques

Hydrolab parameters to be collected are dissolved oxygen, pH, temperature, conductivity and turbidity. The Hydrolab Mini-Sonde will be calibrated for these parameters at the CACO laboratory according to manufacturers' specifications before each sample trip. Water levels will be established and monitored using demarcated staffs.

Discrete samples

Alkalinity: Measurement will be by potentiometric titration using a bromcresol indicator (American Public Health Association 1992).

Aluminum: Water samples will be measured for dissolved aluminum by atomic absorption spectrophotometry at the CACO laboratory. Aluminum levels in natural waters have been associated with reduced survival in amphibian populations (Robert Cook, NPS herpetologist, personal communication).

Chlorophyll a: The water samples will be filtered at the lab through a Whatman GFF filter. The filter will be ground up and extracted with acetone. Then chlorophyll levels in the acetone extract will be measured by on a spectrophotometer (Lorenzen 1966).

Dissolved nutrients: Dissolved inorganic nutrients (nitrate and nitrite, ammonia, and phosphate) will be determine colorimetrically on a Lachat autoanalyzer (American Public Health Association 1992; Lachat Instruments 1993, 1994).

Total nitrogen and phosphorus: Total nitrogen and phosphorus will be determined simultaneously by potassium persulfate digestions followed by colorimetric analysis on

the Lachat autoanalyzer (Valderrama 1981).

Major cation and anion analysis: Ca^{++}, Mg^{++}, K^{+} and Na^{+} ion concentrations will be determined by atomic absorption spectrophotometry at the CACO biology laboratory. Cl^{-} and SO_4^{-} analysis will be performed by ion chromatography at the University of Massachusetts laboratory.

Spartina biomass estimation: *Spartina alterniflora* biomass will be measured by sampling ten quadrats located by stratified-random design adjacent to creek banks 1.0 m from the edge. For each quadrat, all stems were counted, measured and harvested. Then, live and dead stem wet and dry weight will be measured.

Data management and Archiving

All collected data will be entered in a central database at CACO maintained by Charles Farris and the GS5/7 technician. This database will be formatted to be compatible with the Environmental Protection Agency's national water quality database, STORET. The sampling method, detection limit and information about the filtering method and fraction will be included when necessary. The database will also contain information that will assign a unique station name and have descriptive information and GPS coordinates for each station. After the completion of this database, all data will be added to STORET.

References Cited:

American Public Health Association 1992. Standard methods for the examination of water and wastewater, 17th edition. 1134 pg.

Kiviat, E 1997. Sagamore Hill National Historic Site habitat assessment. Report to the Nature Conservancy. Hudsonia, Bard College Field Station, Annandale, NY

Lachat Instruments 1993. Nitrate in brackish or seawater. QuikChem Method 31-107-04-1-A. Lachat Instruments Milwaukee, WI.

Lachat Instruments 1993. Orthophosphate in brackish or seawater. QuikChem Method 31-115-01-3-C. Lachat Instruments Milwaukee, WI.

Lachat Instruments 1994. Ammonia in brackish or seawater. QuikChem Method 31-107-06-1-A. Lachat Instruments Milwaukee, WI.

Lorenzen, C. J. 1966. A method for continuous measurement of *in vivo* chlorophyll concentration. Deep-Sea Res. 13:223-230.

NPS Water Resources Division 1998. Baseline water quality data inventory and analysis – Sagamore Hill National Historic Site. Water Resources Division and Servicewide Inventory and Monitoring Program.

Valderrama, J. C. 1981. The simultaneous analysis of total nitrogen and total phosphorus in natural waters. Marine Chemistry 10: 109-122.

Schedule

Late Summer/Fall 1999	purchase equipment and supplies hire technician
Fall 1999 to Fall 2000	conduct field data collections data analysis
Fall 2000	Sample/data analysis data management
December 2000	submit final report

Deliverables

Reporting Requirements

Upon completion of the field portion of the inventory, an administrative report shall be prepared and submitted to the Park Superintendent and the NPS Water Resources Division. The report will contain a brief description of the inventory process, goals, and objectives; a map depicting the sites inventoried as well as tables depicting the results of the laboratory and field analyses. A 3.5" diskette containing the four files documenting the water-quality inventory results as outlined in the Data Management and Archiving Section above

Budget

	FY00	**FY01**
Personnel		
C. Farris (0.1 FTE)	NESO match	NESO match
K. Lee (0.1 FTE)	CACO match	CACO match
Technician (GS 5/7, 0.4 FTE)	$9,600 (GS-5 + 7% overhead)	$2,400
Travel		
Technician	$200	
Farris	NESO	NESO
Equipment		
Sample collection (vials, tubes)	$500	
Spartina biomass	$400	
CACO Lab Costs		
Sample analysis	$9,500	$2,300
Cation/anion analysis	$3100	

Total Yearly Costs	***$23,300***	***$4,700***
TOTAL		***$28,000***